الجمهورية الجزائرية الديمقراطية الشعبية
People's Democratic Republic of Algeria

Ministry Of Higher Education
And Scientific Research
National School of Cybersecurity

وزارة التعليم العالي
و البحث العلمي
المدرسة الوطنية العليا في الأمن السيبراني

Midterm 1 test

Level: 1st Year

Material : Electricity

Date : Tuesday 26/11/2024

Duration : 1h 30

Exercise1:

7

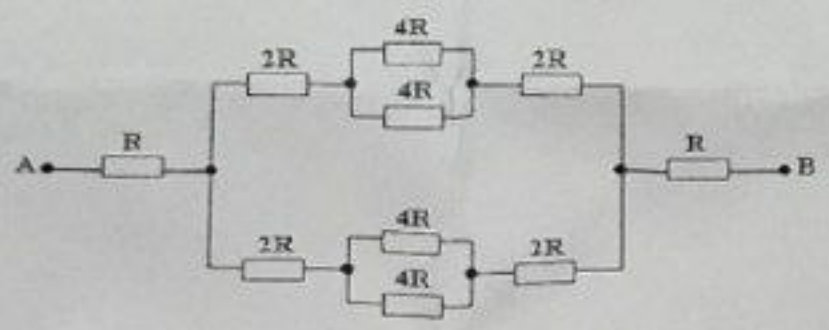
The characteristics of a capacitor are as follows: C=0.12 µF, distance between plate is d=0.2 mm; permittivity of the insulator $\varepsilon_0=8.85\times10^{-12}$ F/m; operating voltage U_s=100 V, Calculate:

1. The area of the plates.
2. The charge of the capacitor subjected to the operating voltage.
3. The energy stored under these conditions.
4. The capacitor being charged, it is isolated, then connected in parallel to a capacitor with capacitance C_1=0.15 µF, initially uncharged. Calculate:
   a- The total charge of the system formed by the two capacitors.
   b- The common voltage across both capacitors and the energy stored.

Exercise2:

7

1- Calculate the equivalent resistance between points A and B of the following circuit:



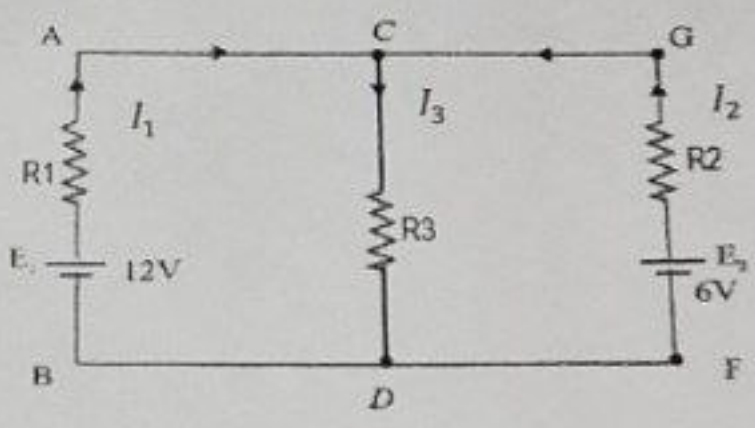
Given: R=4Ω

2- Consider the network shown in figure. Current is supplied to the network by two batteries.

a- Calculate the values of currents I_1, I_2 *and* I_3. The directions of the currents are as indicated by the arrows.

b- Calculate the power supplied and consumed in the circuit.

Given: R_1 =5Ω, R_2 =3Ω and R_3=2Ω



Exercise3:

6

A circular coil with N=110 turns and a radius $r = 0.2\,m$ is placed in a uniform magnetic field B. The magnetic field varies with time according to $B(t) = 2t^2 + 3t + 10$, where $B(t)$ is in Tesla and t is in seconds.

The plane of the coil is perpendicular to the magnetic field.

1. Calculate the magnetic flux through the coil at t=3.
2. Determine the induced electromotive force (EMF) expression in the coil as a function of time.
3. Calculate the magnitude of the induced EMF at t=3.
4. If the resistance of the coil is $R = 5\,\Omega$ determine the current flowing through the coil at t=3s.

Good Luck